



Scientific and Technical Review:

CRD Core Area Liquid Waste Management Plan

Society of Environmental Toxicology and Chemistry



- International non-profit professional society
- >4000 members from 70 countries
- Membership
 - Sectors (Academia, Government, Industry)
 - Disciplines (toxicology, chemistry, biology.....)
- 25+ year history of
 - Advancing science and education
 - Promoting use of good science in decision-making



SETAC's Role

- SETAC established a Steering Committee to select the Chair and Panel Members
- Selection was based on the expertise needed to respond to the CRD's questions, along with balanced representation of various sectors
- Once established, the Panel was independent of CRD, SETAC, and the organizations of the Panel Members.

Report is the consensus of Panel Members

Panel Members



- Rick Gersberg, PhD - *San Diego State University*
- Craig Riley, PE - *WA Dept of Health*
- David Simpson, PhD – *US EPA*
- Dan Smith, PEng, PhD – *University of Alberta*
- Mark Servos, PhD – *University of Waterloo*
- Bill Stubblefield, PhD – *Parametrix/Oregon State University*
- Peter Wells, PhD – *Environment Canada/Dalhousie University*

- Beth Power, MSc – *Azimuth Consulting Group*
– SETAC Project Manager

What are we going to talk about?

- Report covers many topics in depth
- Today's presentation will focus on:
 - Panel's approach
 - Liquid waste management plan
 - Impacts of wastewater discharges
 - Seafloor triggers process
 - Future risks of wastewater management
 - Emerging chemicals of concern
 - Review of wastewater treatment
 - Approach to treatment decision

The Report

- 1 – “The Process”
 - 2 – Public Submissions
 - 3 – Synthesis of Panel’s Findings
 - 4 – Responses to the CRD’s Questions
- Appendixes –
Background and
detailed analysis

Scientific and Technical Review

Capital Regional District Core Area Liquid Waste Management Plan

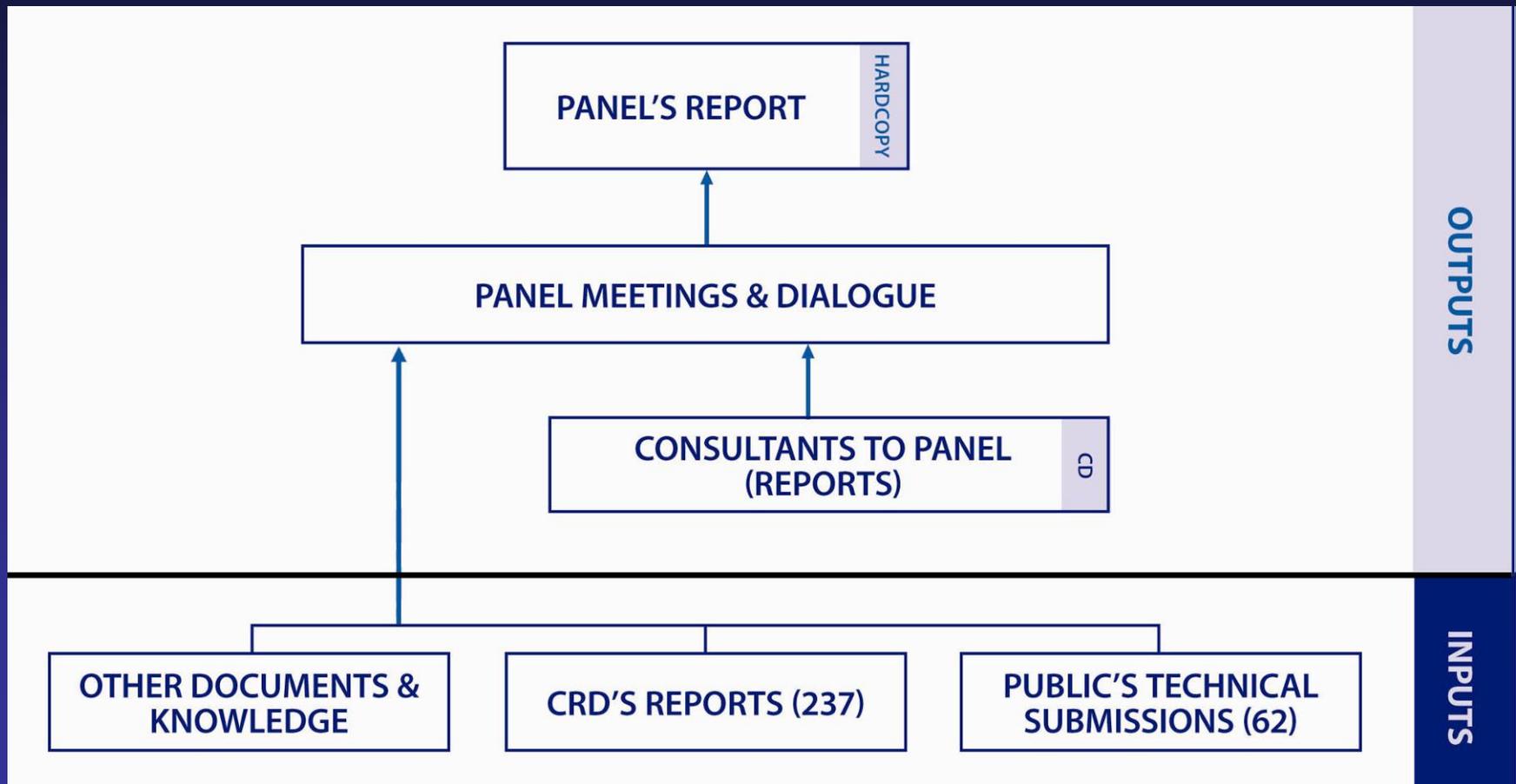
William A. Stubblefield, PhD, Chair
Mark Servos, PhD, Co-Chair
Richard M. Gersberg, PhD
Craig Riley, PE
David Simpson, PhD
Daniel Smith, PEng, PhD
Peter Wells, PhD

**Submitted to the Capital
Regional District Victoria, BC**

**Submitted July 12, 2006, by
the Scientific and Technical
Review Panel**

Written for several audiences

The Panel's Process



Public input to Panel

- Goal:
 - Provide an open public process to meet the Review Panel's need for comprehensive science-based information on liquid waste issues.
- Consisted of a combination of press releases, web site inquiries, and paid advertising.
- Results
 - A total of 82 submissions were received (62 technical and 20 "other").
 - Submitters included 43 individuals and well as 9 organizations
 - BC Sustainable Energy, Georgia Strait Alliance, Sierra Legal Defense Fund, T Buck Suzuki Foundation, etc.

Liquid Waste Management Plan



Stormwater



Harbours' program



Trucked wastes



Source control



Wastewater treatment

LWMP - Overview

- Scope and magnitude of the of the plan is comprehensive and similar to other jurisdictions
- Independent audit indicates the majority of commitments in the LWMP are being met
- The CRD appears to lack the authority to implement/enforce policies for some components of the LWMP (e.g., trucked waste disposal, stormwater, harbour environmental action). The Panel questions whether present institutional arrangements are fully effective for delivery on those commitments in the LWMP.
- The LWMP should be implemented within a watershed framework.

LWMP - Specific Findings

1. CRD's Source Control Program is important and effective, but will only reduce selected contaminants, not eliminate them.
2. Stormwater discharges to nearshore environments are likely to be posing risks to the public and the environment. Stormwater monitoring and management needs to remain a high priority.
3. Given the degree of contamination in the harbours, the CRD should manage stressors to reduce risks to human health and the environment. Priorities should be established with agreement among stakeholders on goals for protection.
4. Sanitary and combined sewer overflows deserve continued attention.

Effects of Wastewater Discharges

- Review of program
 - Review of results of monitoring results
- 
- A photograph of a yellow sailboat with white sails on a blue body of water. In the background, there is a city skyline with various buildings and a large white ship. The sky is clear blue, and many seagulls are flying around the water.

Review of CRD's Wastewater Environmental Monitoring Program

- Comprehensive and designed to evaluate the effects of sewage in the marine environment in and around the discharge points.
- Breadth and scope of the program is impressive and the CRD has endeavoured to incorporate the “best available science” in the monitoring program.
- The existence of an independent panel of experts, the Marine Monitoring Advisory Group (MMAG), as advisers is an important strength of the program.

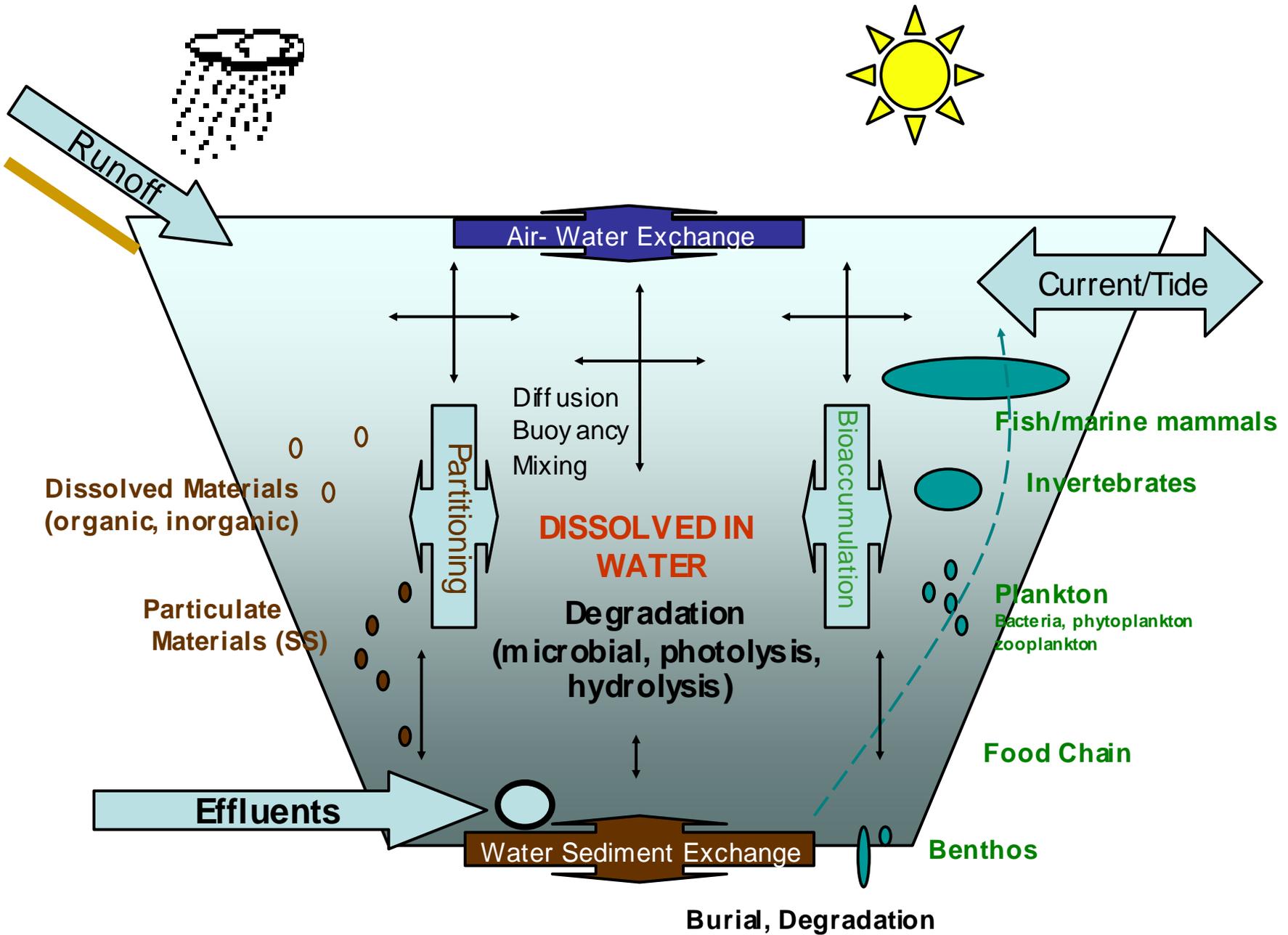
Monitoring Program “Gaps”

- Direct toxicity of the effluent,
- Effect of the effluent on water-column dwelling organisms,
- Monitoring of far-field effects,
- Lacks a predictive capability for estimating fate and distribution of the plumes,
- Additional reference sites are needed with increased replication, and
- Potential effects and risks of persistent organic contaminants through food chain transfer

To have risk, you need both

- **Exposure (contact/dose)**
- **Effects (harm)**

The dose makes the poison



Runoff

Air- Water Exchange

Current/Tide

Dissolved Materials
(organic, inorganic)

Particulate
Materials (SS)

DISSOLVED IN
WATER

Degradation
(microbial, photolysis,
hydrolysis)

Partitioning

Bioaccumulation

Fish/marine mammals

Invertebrates

Plankton
Bacteria, phytoplankton
zooplankton

Food Chain

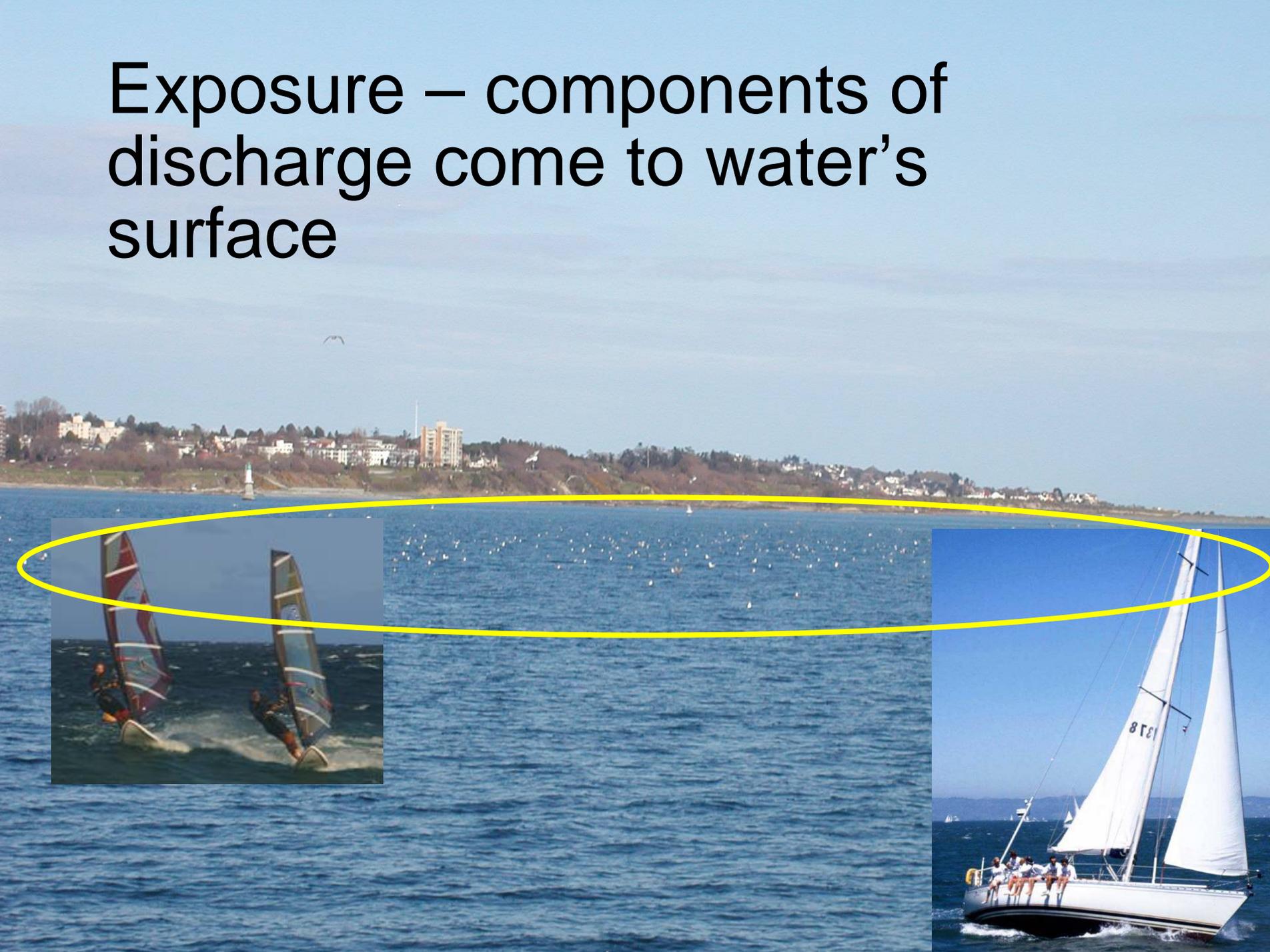
Effluents

Water Sediment Exchange

Benthos

Burial, Degradation

Exposure – components of discharge come to water's surface



Impacts of Wastewater Discharges



- Monitoring focuses on chemicals levels in the seafloor sediments (exposure) and effects:
 - Macaulay: marine life that live in the sediment
 - Clover: mussel growth and chemical levels in tissues
- Environmental changes have occurred to seafloor communities. These are restricted to areas immediately around the outfalls (<400 m) and effects decline with distance from the outfall.
- These effects are not evenly spread around the outfall, but reflect exposure to the plume and its movement with tides/currents

Impacts of Wastewater Discharges (cont'd)

- Macaulay Point:
 - The animal community near the outfall is dominated by pollution tolerant species; the abundance of these species increases because of the availability of organic matter (food) from the effluent.
- Clover Point:
 - Mussel growth increased near the outfall
 - Chemicals levels in mussel tissues show that a number of substances (e.g., copper and lead) are elevated in mussels at the outfall (and in some cases both the near-field and far-field stations) as compared to the reference stations.

Seafloor Triggers

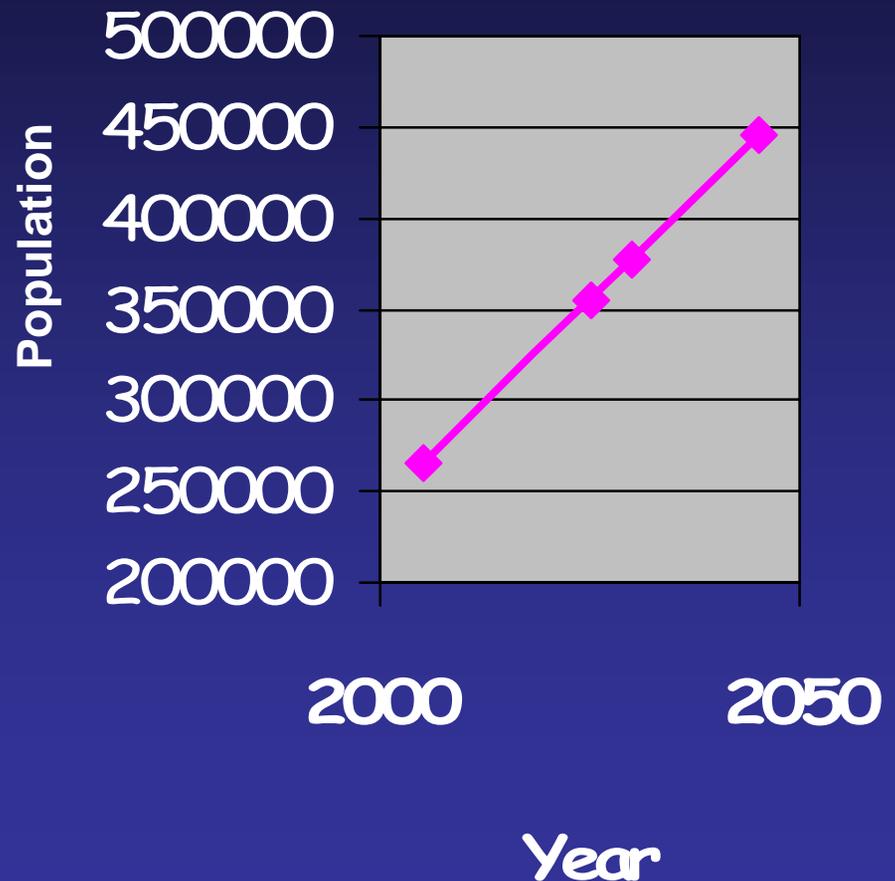
- Seafloor triggers are intended to signal when “unacceptable biological consequences” are occurring in the sediments adjacent to the sewage outfalls and to signal when wastewater treatment is necessary.
- Panel found that the trigger process is generally based on sound environmental monitoring principles, but had concerns about its use as the sole basis for a treatment decision.

Seafloor Triggers (cont'd)

- Difficulties with designing and implementing the process creates considerable uncertainty in terms of the program's potential effectiveness.
 - The responses are non-specific (may not just reflect sewage effects)
 - The trigger process may be insensitive
 - The trigger process is unlikely to trigger a treatment response in a timely manner

Future Risks of Wastewater Management

- Victoria and the vicinity will grow.
- Nutrient loadings will increase.
- Contaminant loadings will likely increase.
- Uncertainties will increase.



How much wastewater is too much?

- When will the “assimilative capacity” be exceeded?
 - What is the ability of the environment to “absorb” toxic inputs without adverse effects showing.
 - No way to accurately predict...

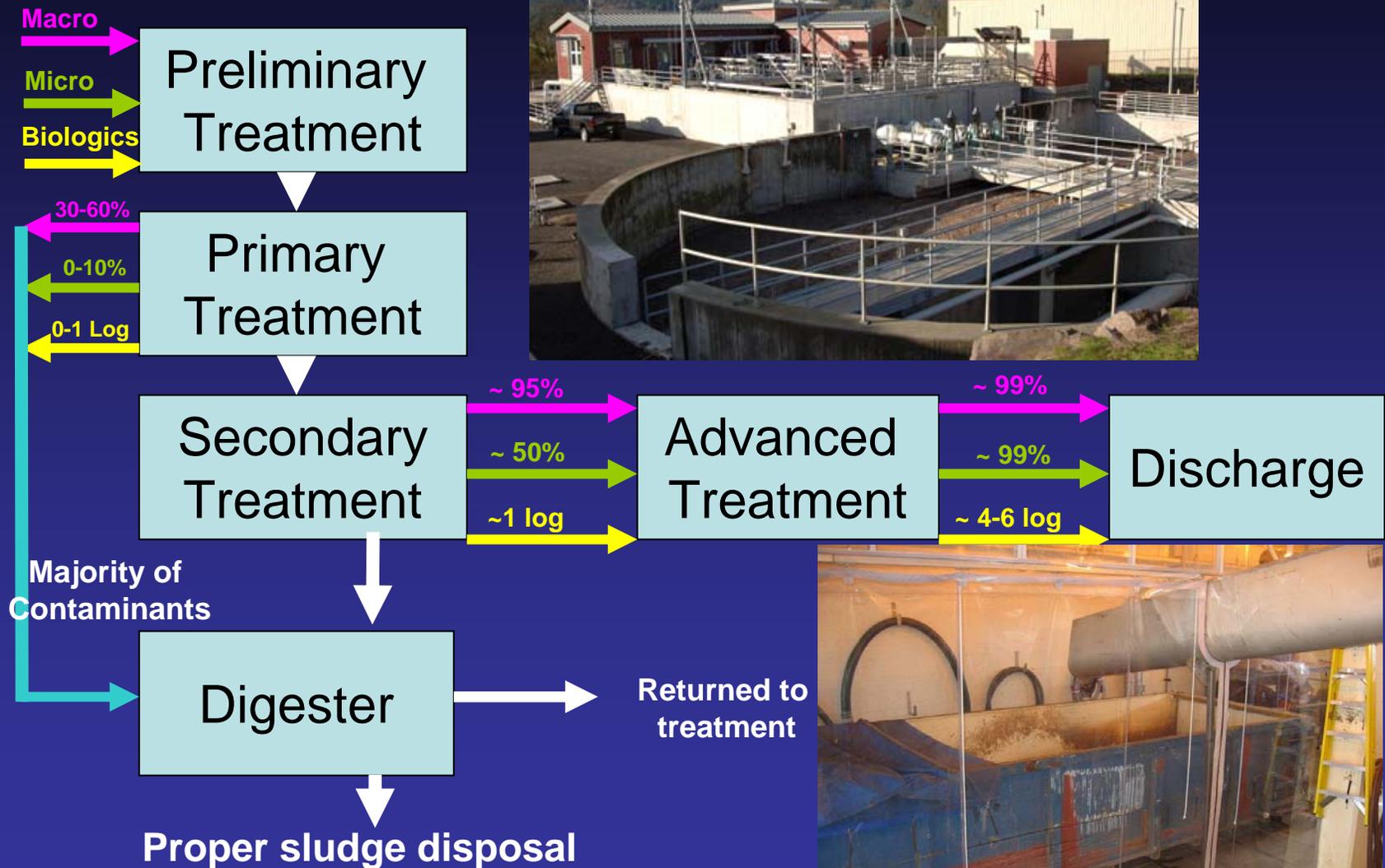
Risks of Emerging Chemicals

- Large number of emerging contaminants: endocrine disruptors, pharmaceuticals, personal care products, etc.
- Their transport and distribution in the environment will vary widely and so will their potential effects; not possible to make generalizations
- These chemicals are not unique to Victoria, but they are difficult to control in current CRD collection system. These chemicals generally are removed with secondary or advanced treatment
- Panel believes these contaminants are causing minimal risks once diluted, but the undiluted effluent is likely to cause biological responses
- The diversity of emerging contaminants results in large uncertainties

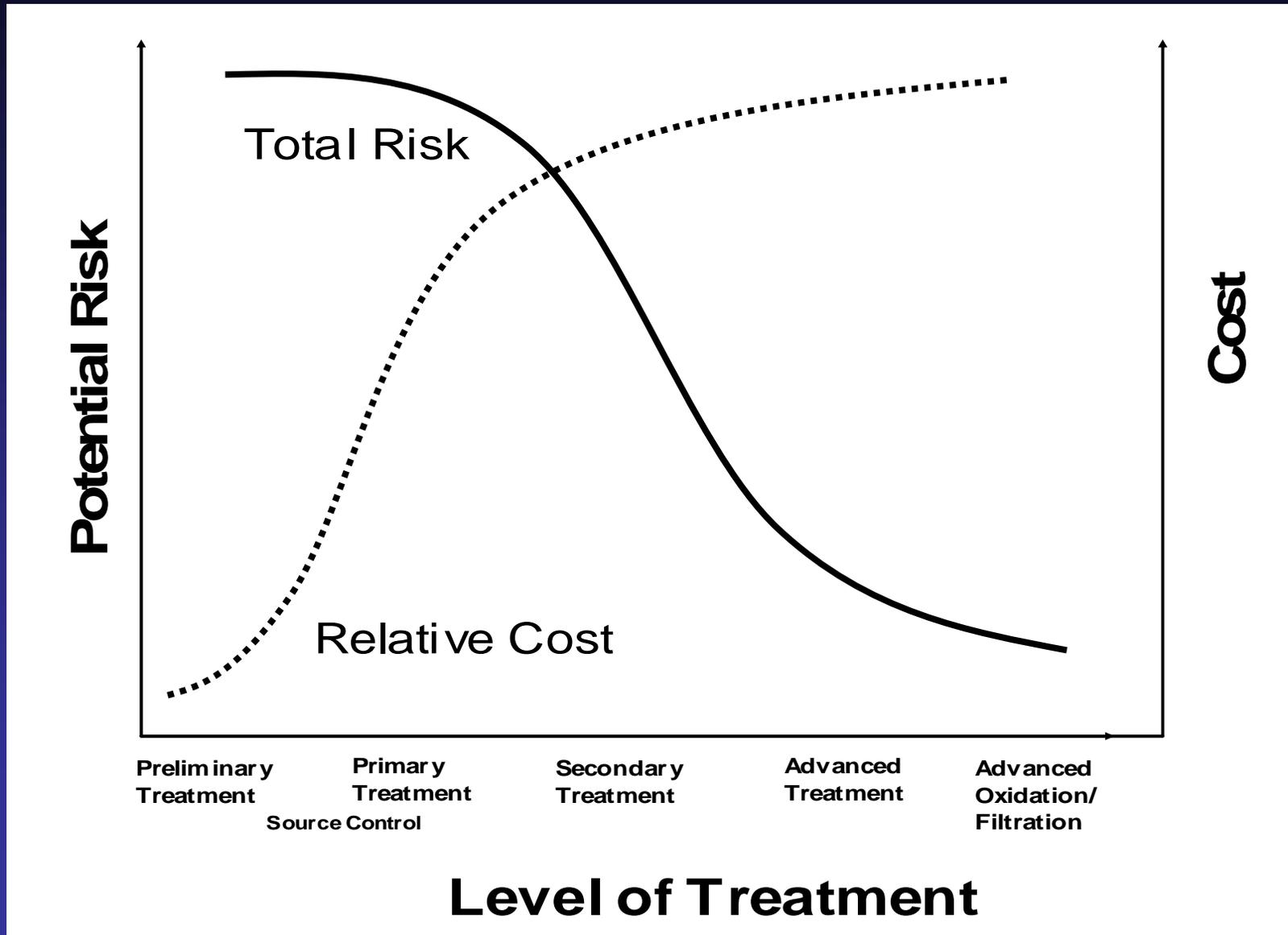
Wastewater Treatment Options



Wastewater Treatment Options and Efficiency



Conceptualized Treatment Costs vs. Risk



To treat or not to treat sewage?



A risk management decision

Balancing Benefits and Costs

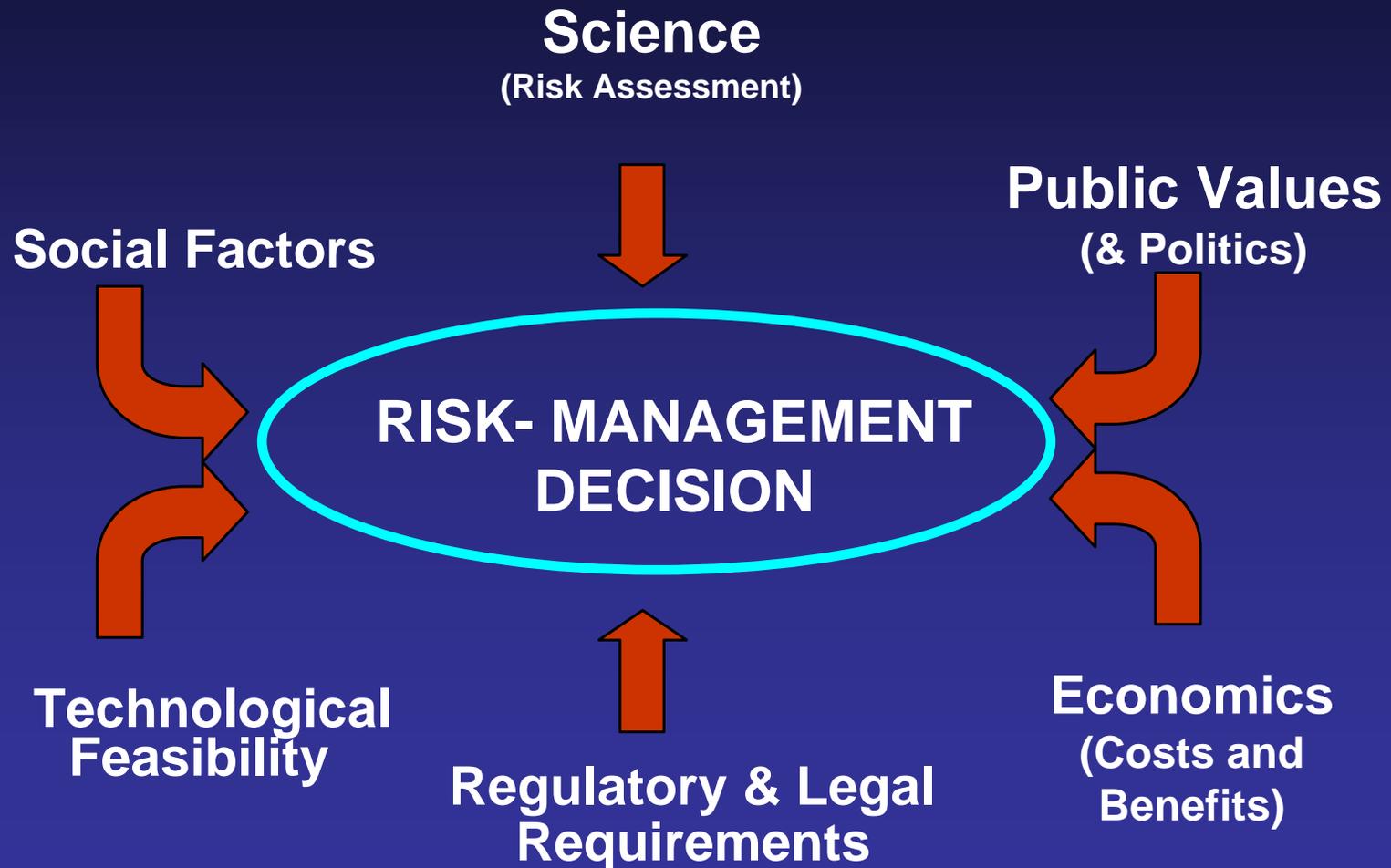
- There is a tremendous volume of scientific data, but the **benefits** of treatment cannot be described or calculated with any precision. This observation does not mean that the benefits of treatment would be insignificant.
- The **costs** of treatment are more certain, and they are significant.
- People can reach different conclusions based on their own interpretation of the evidence and personal values.

Complex situation

Decision Considerations

- Scientific risk concerns, public values, and the prevailing regulatory climate argue for the CRD to improve the quality of its discharged wastewater.
- Expected population growth, resulting in additional nutrient/contaminant loads, must be considered in the decision.
- The Panel finds that reliance on the dilution and natural dispersion processes of the Strait of Juan de Fuca is not a long-term answer.

The Decision-Making Process





*“Thank you for the opportunity to engage in debate
on the challenges that lie ahead”*